

APPENDIX B – RADIOCARBON ANALYSIS REPORT (BETA ANALYTIC)

REPORT OF RADIOCARBON DATING ANALYSES

Ms. Alice Roberts

Report Date: 12/4/2003

Garcia and Associates

Material Received: 11/10/2003

Sample Data	Measured Radiocarbon Age	¹³ C/ ¹² C Ratio	Conventional Radiocarbon Age(*)
Beta - 185333 SAMPLE : BETA #1 ANALYSIS : Radiometric-Standard delivery MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid 2 SIGMA CALIBRATION : Cal AD 1520 to 1580 (Cal BP 430 to 380) AND Cal AD 1630 to 1690 (Cal BP 320 to 260) Cal AD 1730 to 1810 (Cal BP 220 to 140) AND Cal AD 1920 to 1950 (Cal BP 30 to 0)	220 +/- 50 BP	-24.6 o/oo	230 +/- 50 BP
Beta - 185334 SAMPLE : BETA #2 ANALYSIS : AMS-Standard delivery MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid 2 SIGMA CALIBRATION : Cal AD 1520 to 1590 (Cal BP 430 to 360) AND Cal AD 1620 to 1670 (Cal BP 330 to 280) Cal AD 1770 to 1800 (Cal BP 180 to 150) AND Cal AD 1940 to 1950 (Cal BP 10 to 0)	240 +/- 40 BP	-23.5 o/oo	260 +/- 40 BP
Beta - 185335 SAMPLE : BETA #3 ANALYSIS : AMS-Standard delivery MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid 2 SIGMA CALIBRATION : Cal AD 1640 to 1680 (Cal BP 310 to 260) AND Cal AD 1730 to 1810 (Cal BP 220 to 140) Cal AD 1930 to 1950 (Cal BP 20 to 0)	190 +/- 40 BP	-23.1 o/oo	220 +/- 40 BP
Beta - 185336 SAMPLE : BETA #4 ANALYSIS : AMS-Standard delivery MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid 2 SIGMA CALIBRATION : Cal AD 1640 to 1690 (Cal BP 310 to 260) AND Cal AD 1730 to 1810 (Cal BP 220 to 140) Cal AD 1920 to 1950 (Cal BP 30 to 0)	200 +/- 40 BP	-24.1 o/oo	210 +/- 40 BP
Beta - 185337 SAMPLE : BETA #5 ANALYSIS : AMS-Standard delivery MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid 2 SIGMA CALIBRATION : Cal AD 1480 to 1660 (Cal BP 470 to 290)	100 +/- 40 BP	-12.8 o/oo	300 +/- 40 BP

Dates are reported as RCYBP (radiocarbon years before present, "present" = 1950A.D.). By International convention, the modern reference standard was 95% of the C14 content of the National Bureau of Standards' Oxalic Acid & calculated using the Libby C14 half life (5568 years). Quoted errors represent 1 standard deviation statistics (68% probability) & are based on combined measurements of the sample, background, and modern reference standards.

Measured C13/C12 ratios were calculated relative to the PDB-1 international standard and the RCYBP ages were normalized to -25 per mil. If the ratio and age are accompanied by an (*), then the C13/C12 value was estimated, based on values typical of the material type. The quoted results are NOT calibrated to calendar years. Calibration to calendar years should be calculated using the Conventional C14 age.

REPORT OF RADIOCARBON DATING ANALYSES

Ms. Alice Roberts

Report Date: 12/4/2003

Sample Data	Measured Radiocarbon Age	¹³ C/ ¹² C Ratio	Conventional Radiocarbon Age(*)
Beta - 185338 SAMPLE : BETA #6 ANALYSIS : AMS-Standard delivery MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid 2 SIGMA CALIBRATION : Cal AD 1490 to 1680 (Cal BP 460 to 270) AND Cal AD 1770 to 1800 (Cal BP 180 to 150) Cal AD 1940 to 1950 (Cal BP 10 to 0)	240 +/- 50 BP	-22.9 o/oo	270 +/- 50 BP
Beta - 185339 SAMPLE : BETA #7 ANALYSIS : AMS-Standard delivery MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid 2 SIGMA CALIBRATION : Cal AD 1650 to 1890 (Cal BP 300 to 60) AND Cal AD 1910 to 1950 (Cal BP 40 to 0)	120 +/- 40 BP	-22.2 o/oo	170 +/- 40 BP
Beta - 185340 SAMPLE : BETA #8 ANALYSIS : Radiometric-Standard delivery (with extended counting) MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid 2 SIGMA CALIBRATION : Cal AD 1450 to 1660 (Cal BP 500 to 290)	300 +/- 50 BP	-23.1 o/oo	330 +/- 50 BP
Beta - 185341 SAMPLE : BETA #9 ANALYSIS : AMS-Standard delivery MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid 2 SIGMA CALIBRATION : Cal AD 1170 to 1280 (Cal BP 780 to 670)	830 +/- 40 BP	-26.2 o/oo	810 +/- 40 BP
Beta - 185342 SAMPLE : BETA #10 ANALYSIS : AMS-Standard delivery MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid 2 SIGMA CALIBRATION : Cal AD 1240 to 1300 (Cal BP 710 to 650)	740 +/- 40 BP	-25.9 o/oo	730 +/- 40 BP

Dates are reported as RCYBP (radiocarbon years before present, "present" = 1950 A.D.). By International convention, the modern reference standard was 95% of the C14 content of the National Bureau of Standards' Oxalic Acid & calculated using the Libby C14 half life (5568 years). Quoted errors represent 1 standard deviation statistics (68% probability) & are based on combined measurements of the sample, background, and modern reference standards.

Measured C13/C12 ratios were calculated relative to the PDB-1 international standard and the RCYBP ages were normalized to -25 per mil. If the ratio and age are accompanied by an (*), then the C13/C12 value was estimated, based on values typical of the material type. The quoted results are NOT calibrated to calendar years. Calibration to calendar years should be calculated using the Conventional C14 age.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-24.6:lab. mult=1)

Laboratory number: Beta-185333

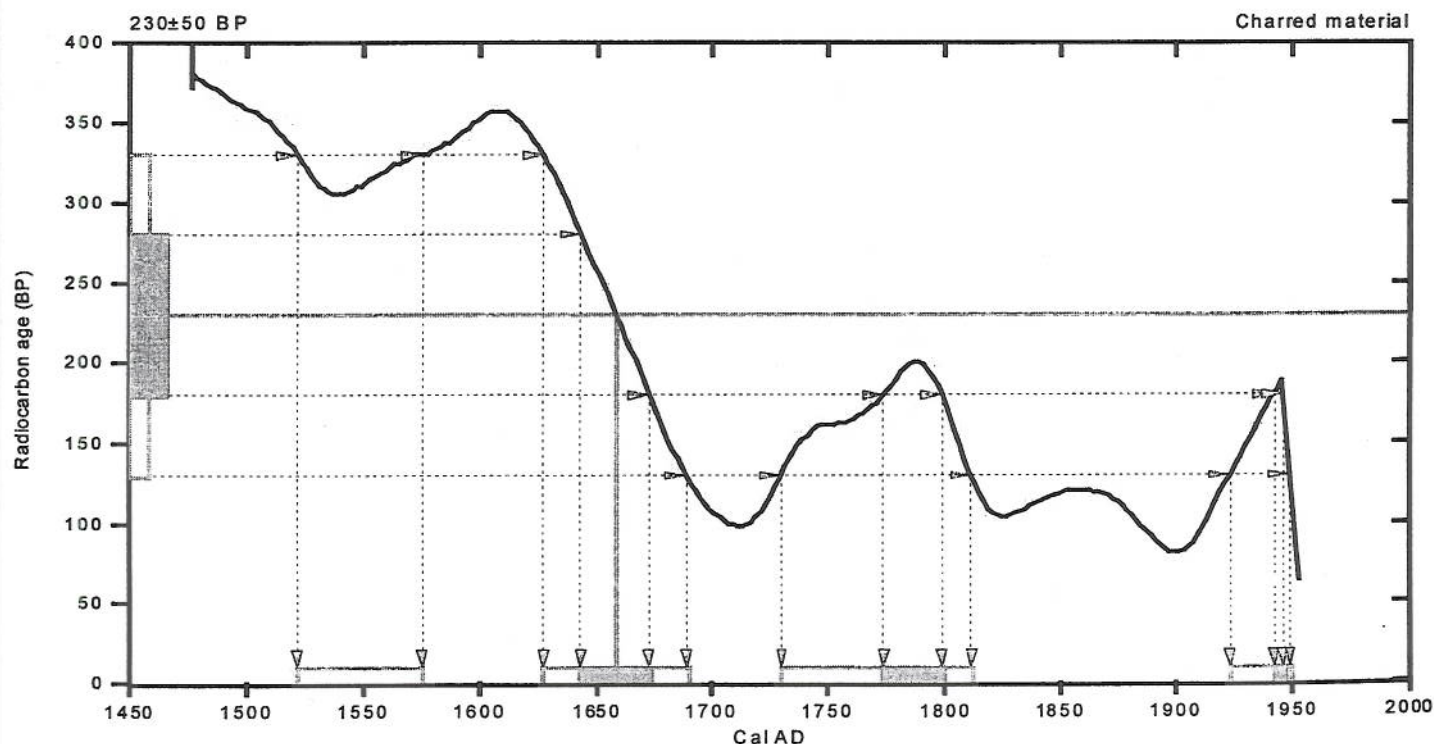
Conventional radiocarbon age: 230 ± 50 BP

2 Sigma calibrated results: Cal AD 1520 to 1580 (Cal BP 430 to 380) and
(95% probability) Cal AD 1630 to 1690 (Cal BP 320 to 260) and
Cal AD 1730 to 1810 (Cal BP 220 to 140) and
Cal AD 1920 to 1950 (Cal BP 30 to 0)

Intercept data

Intercept of radiocarbon age
with calibration curve: Cal AD 1660 (Cal BP 290)

1 Sigma calibrated results: Cal AD 1640 to 1670 (Cal BP 310 to 280) and
(68% probability) Cal AD 1770 to 1800 (Cal BP 180 to 150) and
Cal AD 1940 to 1950 (Cal BP 10 to 0)



References:

Database used

Calibration Database

Editorial Comment

Stuiver, M., van der Plicht, H., 1998, *Radiocarbon* 40(3), pxi-xiii

INTCAL98 Radiocarbon Age Calibration

Stuiver, M., et. al., 1998, *Radiocarbon* 40(3), p1041-1083

Mathematics

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, *Radiocarbon* 35(2), p317-322

Beta Analytic Inc.

4985 SW 74 Court, Miami, Florida 33155 USA • Tel: (305) 667 5167 • Fax: (305) 663 0964 • E-Mail: beta@radiocarbon.com

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-23.5;lab. mult=1)

Laboratory number: Beta-185334

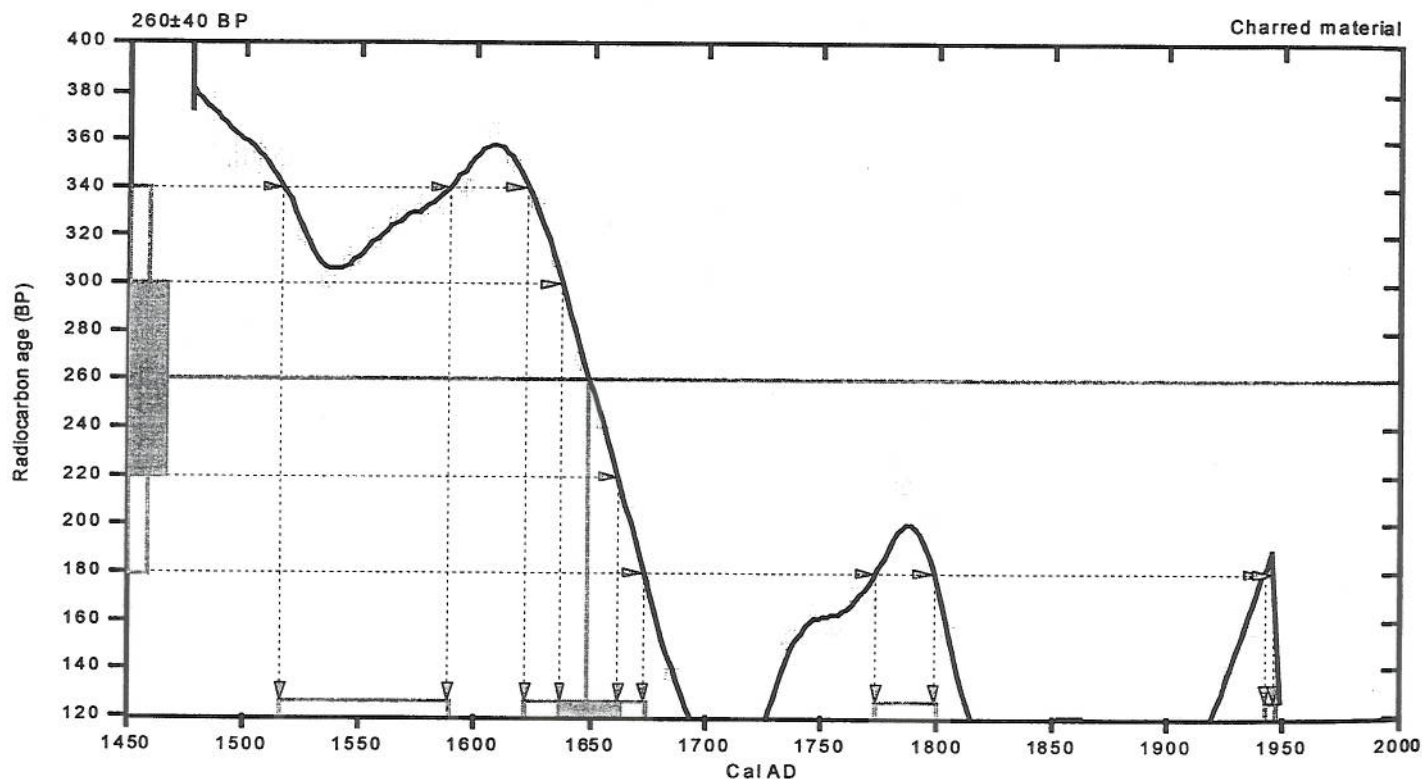
Conventional radiocarbon age: 260 ± 40 BP

2 Sigma calibrated results: Cal AD 1520 to 1590 (Cal BP 430 to 360) and
(95% probability) Cal AD 1620 to 1670 (Cal BP 330 to 280) and
Cal AD 1770 to 1800 (Cal BP 180 to 150) and
Cal AD 1940 to 1950 (Cal BP 10 to 0)

Intercept data

Intercept of radiocarbon age
with calibration curve: Cal AD 1650 (Cal BP 300)

1 Sigma calibrated result: Cal AD 1640 to 1660 (Cal BP 310 to 290)
(68% probability)



References:

Database used

Calibration Database

Editorial Comment

Stuiver, M., van der Plicht, H., 1998, *Radiocarbon* 40(3), pxii-xlii
INTCAL98 Radiocarbon Age Calibration

Stuiver, M., et. al., 1998, *Radiocarbon* 40(3), p1041-1083

Mathematics

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, *Radiocarbon* 35(2), p317-322

Beta Analytic Inc.

4985 SW 74 Court, Miami, Florida 33155 USA • Tel: (305) 667 5167 • Fax: (305) 663 0964 • E-Mail: beta@radiocarbon.com

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-23.1:lab. mult=1)

Laboratory number: **Beta-185335**

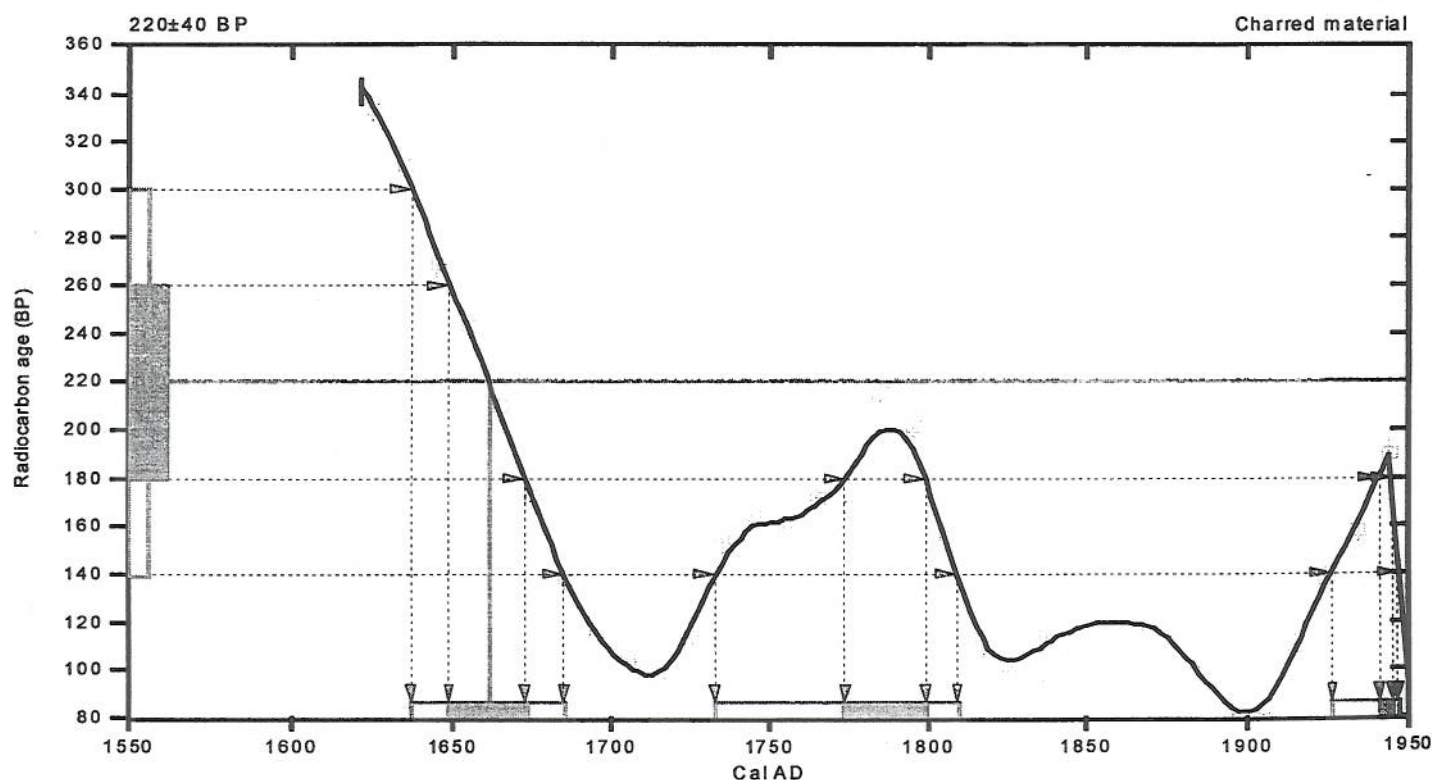
Conventional radiocarbon age: **220±40 BP**

2 Sigma calibrated results: Cal AD 1640 to 1680 (Cal BP 310 to 260) and
(95% probability) Cal AD 1730 to 1810 (Cal BP 220 to 140) and
Cal AD 1930 to 1950 (Cal BP 20 to 0)

Intercept data

Intercept of radiocarbon age
with calibration curve: Cal AD 1660 (Cal BP 290)

1 Sigma calibrated results: Cal AD 1650 to 1670 (Cal BP 300 to 280) and
(68% probability) Cal AD 1770 to 1800 (Cal BP 180 to 150) and
Cal AD 1940 to 1950 (Cal BP 10 to 0)



References:

Database used

Calibration Database

Editorial Comment

Stuiver, M., van der Plicht, H., 1998, Radiocarbon 40(3), pxii-xiii

INTCAL98 Radiocarbon Age Calibration

Stuiver, M., et al., 1998, Radiocarbon 40(3), p1041-1083

Mathematics

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

Beta Analytic Inc.

4985 SW 74 Court, Miami, Florida 33155 USA • Tel: (305) 667 5167 • Fax: (305) 663 0964 • E-Mail: beta@radiocarbon.com

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-24.1:lab. mult=1)

Laboratory number: Beta-185336

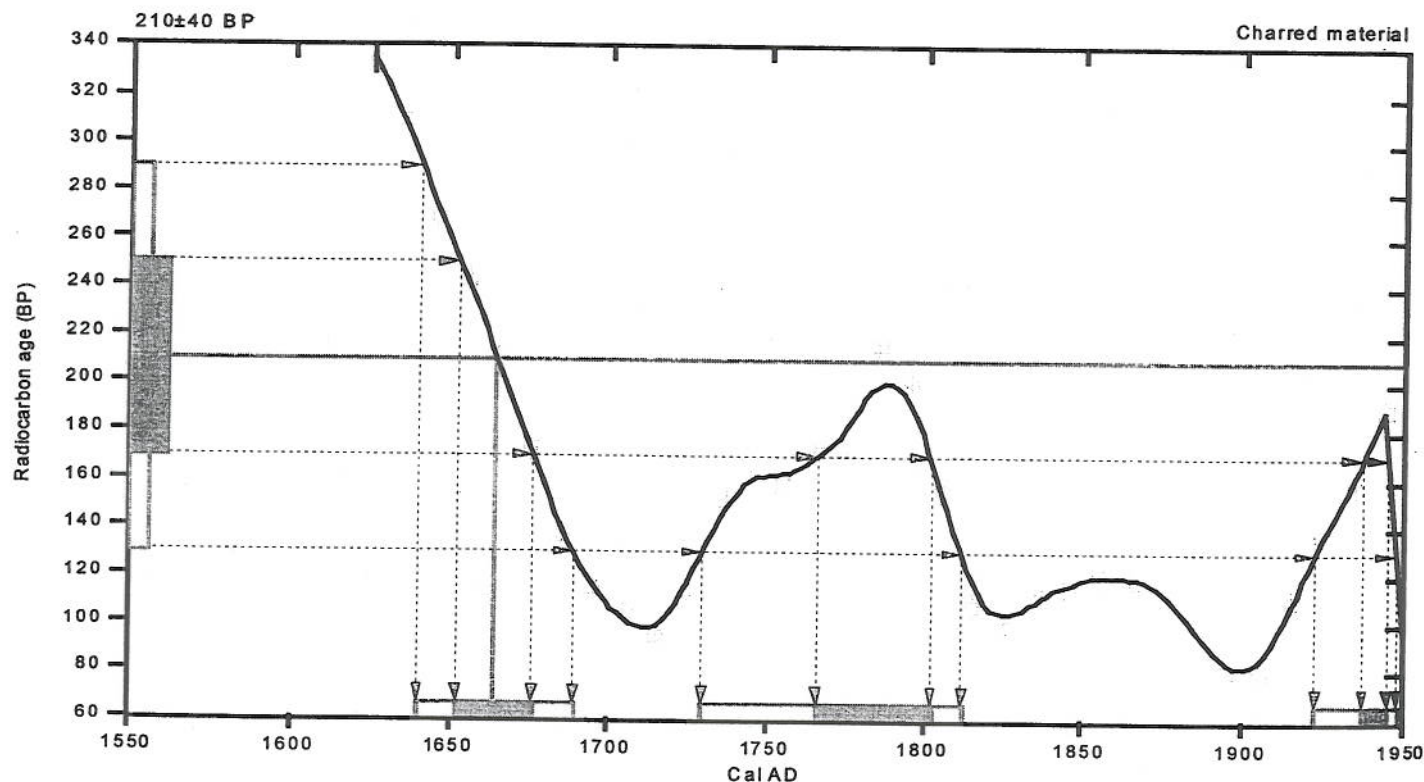
Conventional radiocarbon age: 210±40 BP

2 Sigma calibrated results: Cal AD 1640 to 1690 (Cal BP 310 to 260) and
(95% probability) Cal AD 1730 to 1810 (Cal BP 220 to 140) and
Cal AD 1920 to 1950 (Cal BP 30 to 0)

Intercept data

Intercept of radiocarbon age
with calibration curve: Cal AD 1660 (Cal BP 290)

1 Sigma calibrated results: Cal AD 1650 to 1680 (Cal BP 300 to 270) and
(68% probability) Cal AD 1770 to 1800 (Cal BP 180 to 150) and
Cal AD 1940 to 1950 (Cal BP 10 to 0)



References:

Database used

Calibration Database

Editorial Comment

Stuiver, M., van der Plicht, H., 1998, Radiocarbon 40(3), pxii-xiii

INTCAL98 Radiocarbon Age Calibration

Stuiver, M., et. al., 1998, Radiocarbon 40(3), p1041-1083

Mathematics

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

Beta Analytic Inc.

4985 SW 74 Court, Miami, Florida 33155 USA • Tel: (305) 667 5167 • Fax: (305) 663 0964 • E-Mail: beta@radiocarbon.com

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-12.8:lab. mult=1)

Laboratory number: Beta-185337

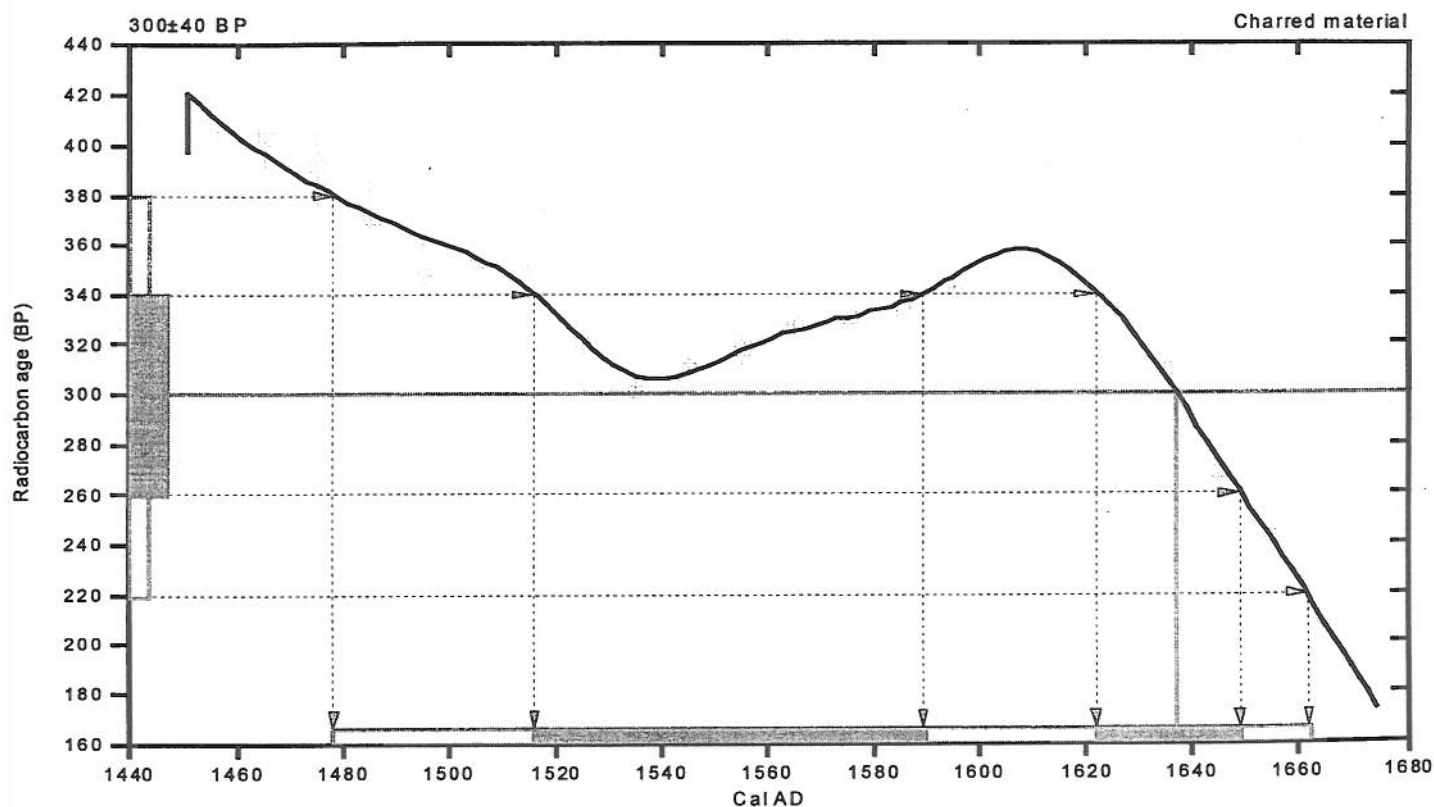
Conventional radiocarbon age: 300 ± 40 BP

2 Sigma calibrated result: Cal AD 1480 to 1660 (Cal BP 470 to 290)
(95% probability)

Intercept data

Intercept of radiocarbon age
with calibration curve: Cal AD 1640 (Cal BP 310)

1 Sigma calibrated results: Cal AD 1520 to 1590 (Cal BP 430 to 360) and
(68% probability) Cal AD 1620 to 1650 (Cal BP 330 to 300)



References:

Database used

Calibration Database

Editorial Comment

Stuiver, M., van der Plicht, H., 1998, *Radiocarbon* 40(3), pxi-xiii

INTCAL98 Radiocarbon Age Calibration

Stuiver, M., et. al., 1998, *Radiocarbon* 40(3), p1041-1083

Mathematics

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, *Radiocarbon* 35(2), p317-322

Beta Analytic Inc.

4985 SW 74 Court, Miami, Florida 33155 USA • Tel: (305) 667 5167 • Fax: (305) 663 0964 • E-Mail: beta@radiocarbon.com

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-22.9:lab. mult=1)

Laboratory number: Beta-185338

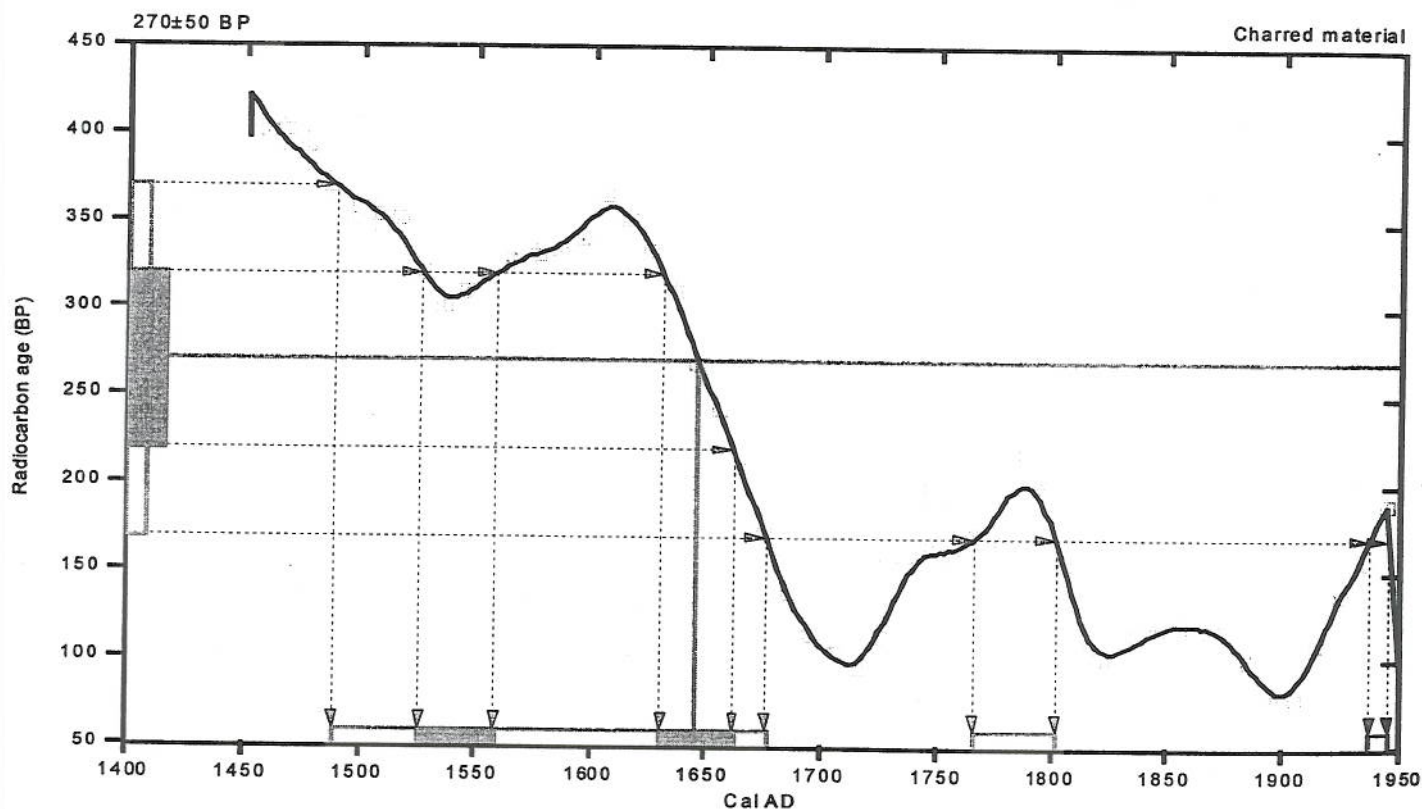
Conventional radiocarbon age: 270 ± 50 BP

2 Sigma calibrated results: Cal AD 1490 to 1680 (Cal BP 460 to 270) and
(95% probability) Cal AD 1770 to 1800 (Cal BP 180 to 150) and
Cal AD 1940 to 1950 (Cal BP 10 to 0)

Intercept data

Intercept of radiocarbon age
with calibration curve: Cal AD 1650 (Cal BP 300)

1 Sigma calibrated results: Cal AD 1530 to 1560 (Cal BP 420 to 390) and
(68% probability) Cal AD 1630 to 1660 (Cal BP 320 to 290)



References:

Database used

Calibration Database

Editorial Comment

Stuiver, M., van der Plicht, H., 1998, *Radiocarbon* 40(3), pxi-xiii

INTCAL98 Radiocarbon Age Calibration

Stuiver, M., et. al., 1998, *Radiocarbon* 40(3), p1041-1083

Mathematics

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, *Radiocarbon* 35(2), p317-322

Beta Analytic Inc.

4985 SW 74 Court, Miami, Florida 33155 USA • Tel: (305) 667 5167 • Fax: (305) 663 0964 • E-Mail: beta@radiocarbon.com

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-22.2:lab. mult=1)

Laboratory number: Beta-185339

Conventional radiocarbon age: 170 ± 40 BP

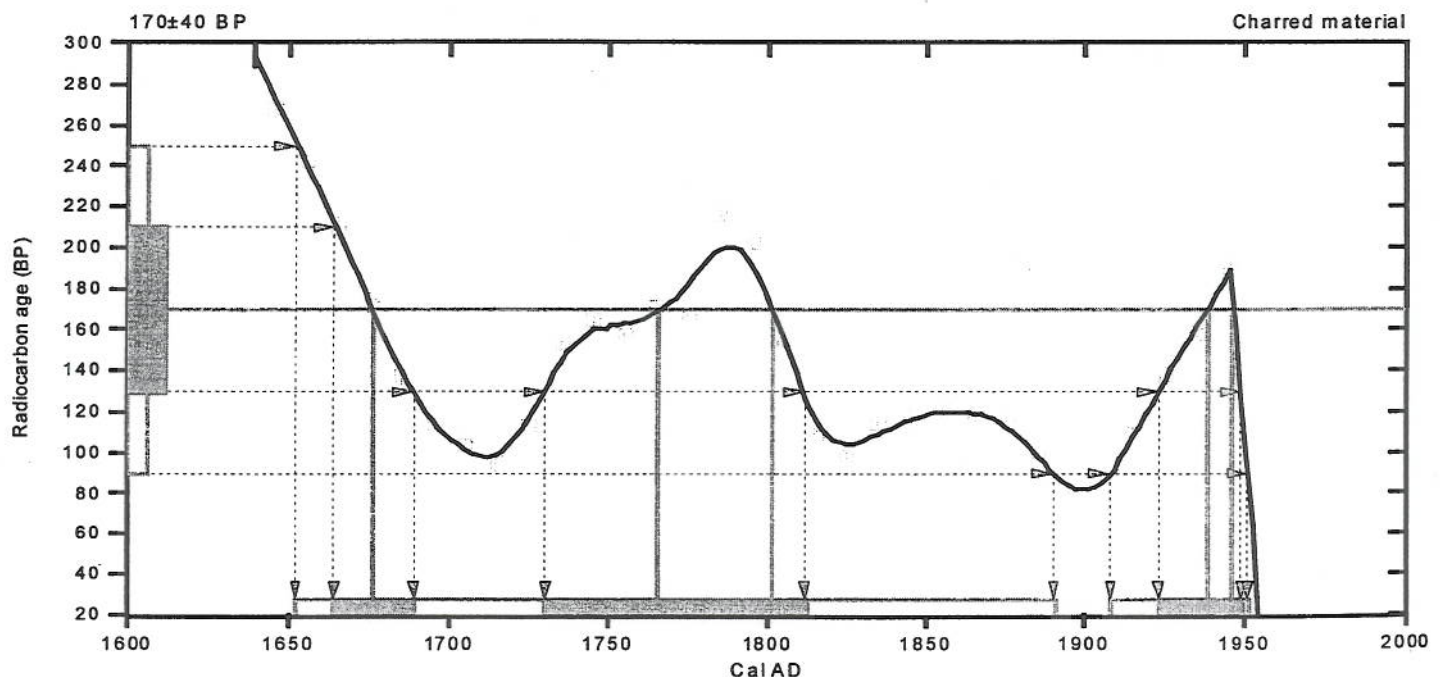
2 Sigma calibrated results: Cal AD 1650 to 1890 (Cal BP 300 to 60) and
(95% probability) Cal AD 1910 to 1950 (Cal BP 40 to 0)

Intercept data

Intercepts of radiocarbon age
with calibration curve:

Cal AD 1680 (Cal BP 270) and
Cal AD 1770 (Cal BP 180) and
Cal AD 1800 (Cal BP 150) and
Cal AD 1940 (Cal BP 10) and
Cal AD 1950 (Cal BP 0)

1 Sigma calibrated results: Cal AD 1660 to 1690 (Cal BP 290 to 260) and
(68% probability) Cal AD 1730 to 1810 (Cal BP 220 to 140) and
Cal AD 1920 to 1950 (Cal BP 30 to 0)



References:

Database used

Calibration Database

Editorial Comment

Stuiver, M., van der Plicht, H., 1998, *Radiocarbon* 40(3), pxi-xiii

INTCAL98 Radiocarbon Age Calibration

Stuiver, M., et. al., 1998, *Radiocarbon* 40(3), p1041-1083

Mathematics

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, *Radiocarbon* 35(2), p317-322

Beta Analytic Inc.

4985 SW 74 Court, Miami, Florida 33155 USA • Tel: (305) 667 5167 • Fax: (305) 663 0964 • E-Mail: beta@radiocarbon.com

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-23.1:lab. mult=1)

Laboratory number: **Beta-185340**

Conventional radiocarbon age: **330±50 BP**

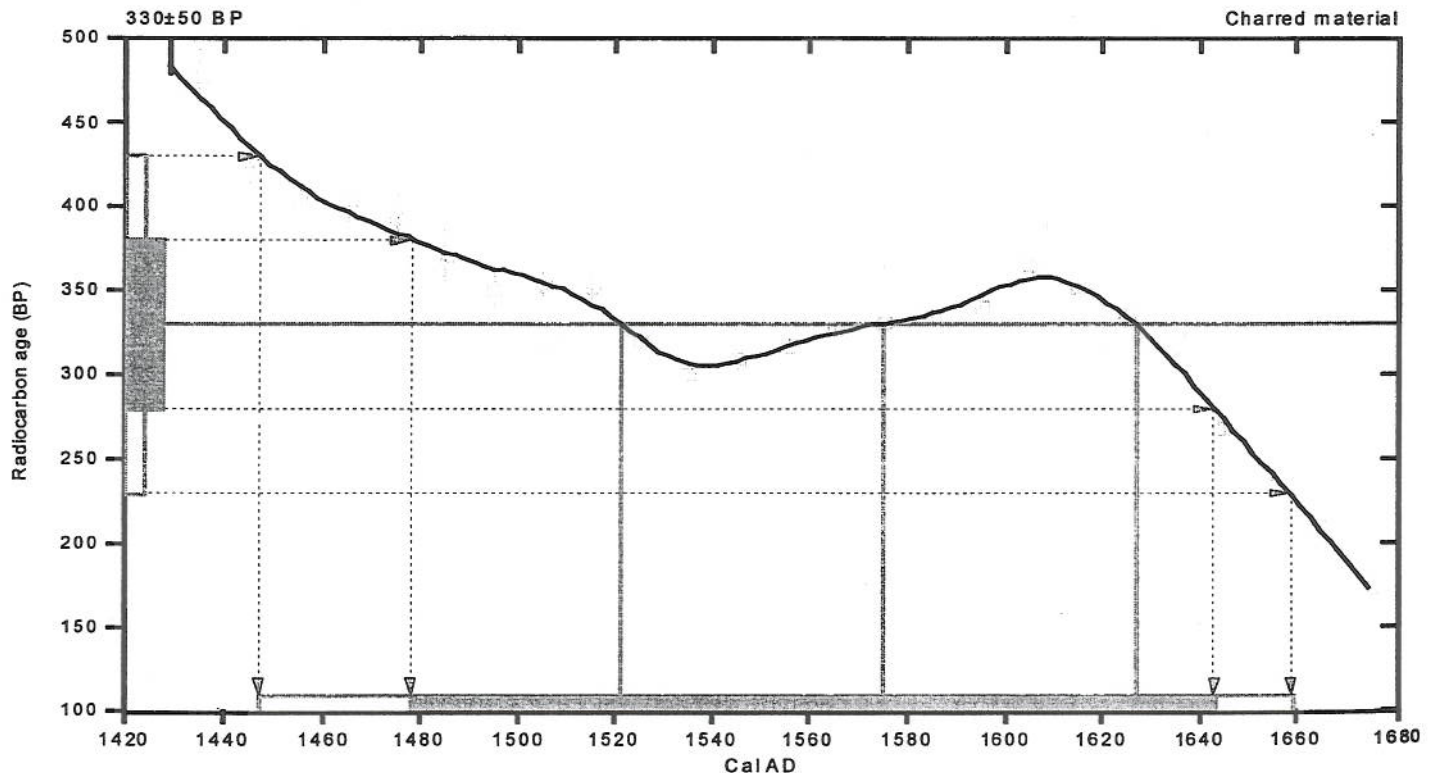
2 Sigma calibrated result: Cal AD 1450 to 1660 (Cal BP 500 to 290)
(95% probability)

Intercept data

Intercepts of radiocarbon age
with calibration curve:

Cal AD 1520 (Cal BP 430) and
Cal AD 1580 (Cal BP 380) and
Cal AD 1630 (Cal BP 320)

1 Sigma calibrated result: Cal AD 1480 to 1640 (Cal BP 470 to 310)
(68% probability)



References:

Database used

Calibration Database

Editorial Comment

Stuiver, M., van der Plicht, H., 1998, Radiocarbon 40(3), pxii-xiii

INTCAL98 Radiocarbon Age Calibration

Stuiver, M., et. al., 1998, Radiocarbon 40(3), p1041-1083

Mathematics

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

Beta Analytic Inc.

4985 SW 74 Court, Miami, Florida 33155 USA • Tel: (305) 667 5167 • Fax: (305) 663 0964 • E-Mail: beta@radiocarbon.com

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-26.2:lab. mult=1)

Laboratory number: **Beta-185341**

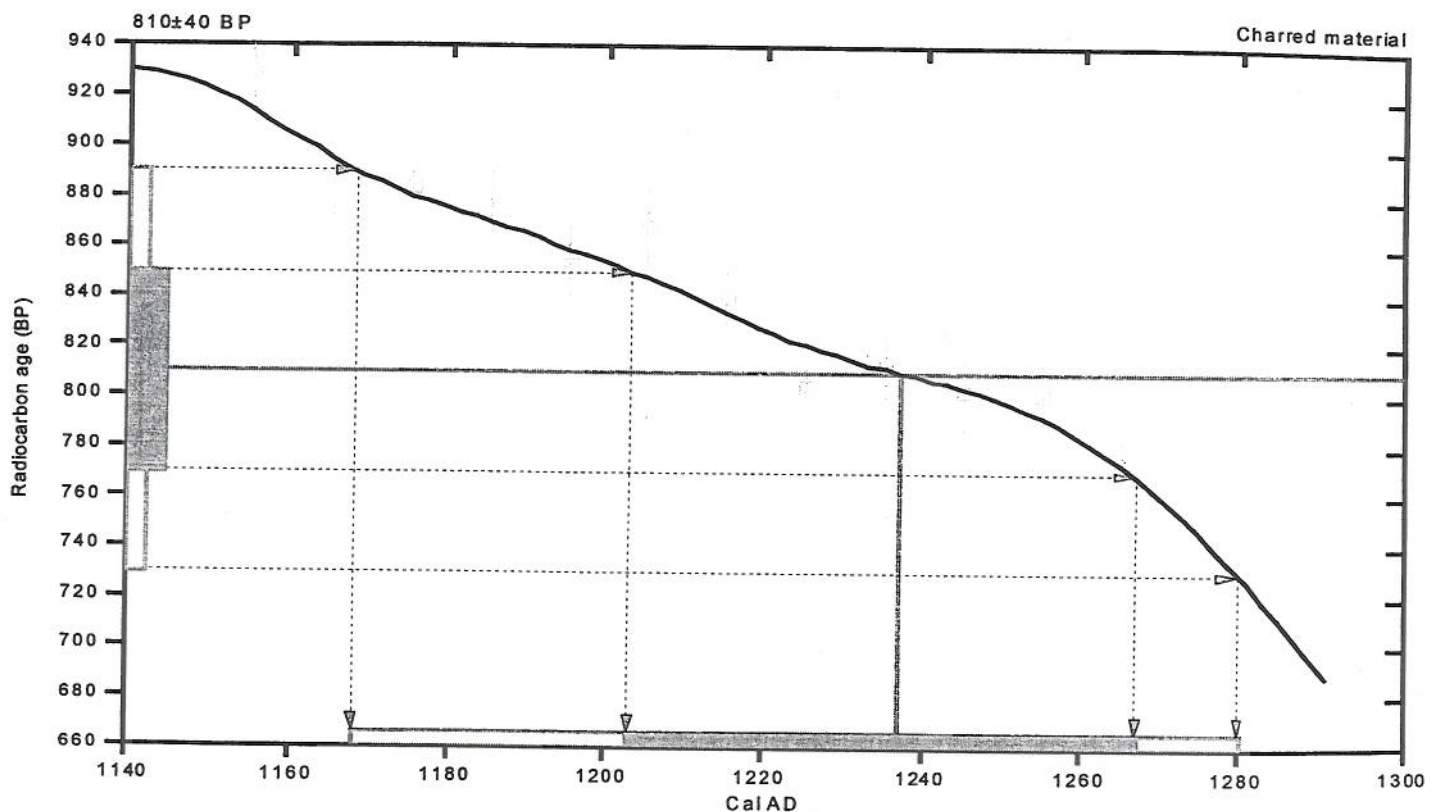
Conventional radiocarbon age: **810±40 BP**

2 Sigma calibrated result: **Cal AD 1170 to 1280 (Cal BP 780 to 670)**
(95% probability)

Intercept data

Intercept of radiocarbon age
with calibration curve: **Cal AD 1240 (Cal BP 710)**

1 Sigma calibrated result: **Cal AD 1200 to 1270 (Cal BP 750 to 680)**
(68% probability)



References:

Database used

Calibration Database

Editorial Comment

Stuiver, M., van der Plicht, H., 1998, *Radiocarbon* 40(3), pxii-xiii

INTCAL98 Radiocarbon Age Calibration

Stuiver, M., et. al., 1998, *Radiocarbon* 40(3), p1041-1083

Mathematics

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, *Radiocarbon* 35(2), p317-322

Beta Analytic Inc.

4985 SW 74 Court, Miami, Florida 33155 USA • Tel: (305) 667 5167 • Fax: (305) 663 0964 • E-Mail: beta@radiocarbon.com

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-25.9:lab. mult=1)

Laboratory number: Beta-185342

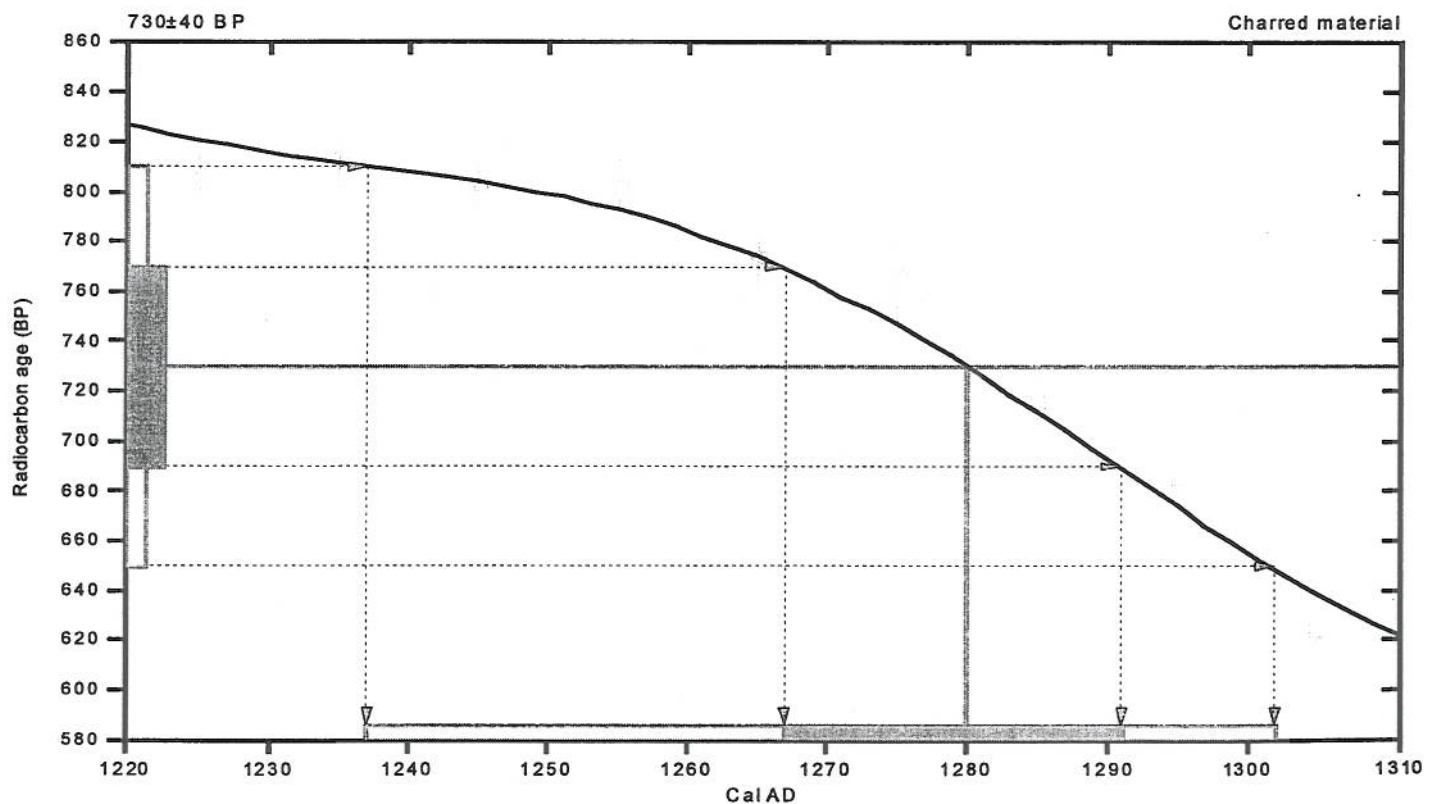
Conventional radiocarbon age: 730±40 BP

2 Sigma calibrated result: Cal AD 1240 to 1300 (Cal BP 710 to 650)
(95% probability)

Intercept data

Intercept of radiocarbon age
with calibration curve: Cal AD 1280 (Cal BP 670)

1 Sigma calibrated result: Cal AD 1270 to 1290 (Cal BP 680 to 660)
(68% probability)



References:

Database used

Calibration Database

Editorial Comment

Stuiver, M., van der Plicht, H., 1998, *Radiocarbon* 40(3), pxii-xiii

INTCAL98 Radiocarbon Age Calibration

Stuiver, M., et al., 1998, *Radiocarbon* 40(3), p1041-1083

Mathematics

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, *Radiocarbon* 35(2), p317-322

Beta Analytic Inc.

4985 SW 74 Court, Miami, Florida 33155 USA • Tel: (305) 667 5167 • Fax: (305) 663 0964 • E-Mail: beta@radiocarbon.com